

# Topology Optimization of a Bracket

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## Original bracket from the bike

- Bracket on the bike is made out of 6061 Aluminium stated by KTM forum (manufacturer specifications)
- The manufacturing process of the original part is a casting
- In the design of the bracket it needed to be curved to fit from the side of the frame down into the back of the motor



Photo by: Cordell Potter

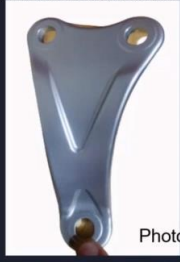


Photo by: Cordell Potter

## Brackets on Bike

The brackets were mounted on the motorcycle to ensure proper alignment before testing.



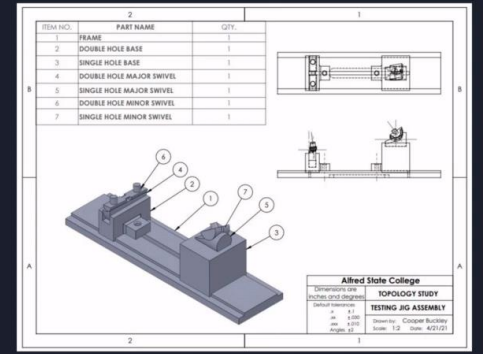
Photos by: Cordell Potter

## Designing of Optimized Bracket

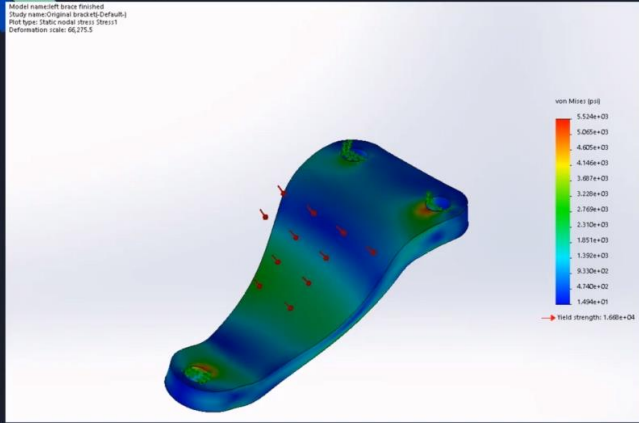
- The original bracket modeled in SolidWorks was imported into a program specifically for topology optimization called Inspire 2021.
- To start the process a design space was created so the hole locations could not be modified, then the constraints of the part we implemented.
  - The holes were fixed pin connections
  - The force was in the center of the part pushing vertically down on the face as testing would occur
  - There would only be a maximum reduction of 30% of its weight by mass while maximizing the stiffness of the bracket

## Testing Jig for a Bend Test

- Support the part at three pins and two surfaces.
- Allow the part to flex by sliding and rotating.
- Allow the part to swivel so the force impacts at two patches.
- The support structures are bolted and can slide along parallel rails.



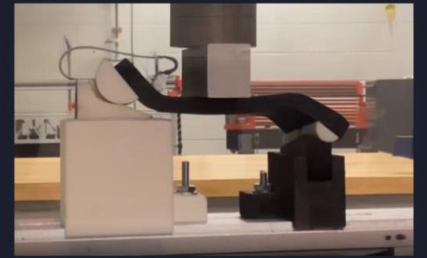
## Original Stress Plot



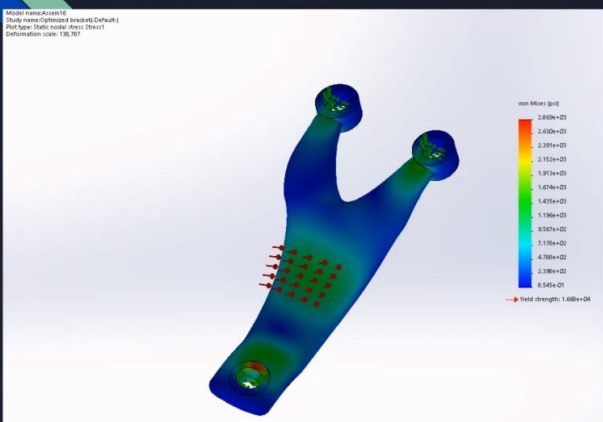
Graphic: SolidWorks Simulation

## Support Structures

- Each side is distinguished by the number of holes it supports.
- Two directions of rotation
- Minor and major swivel.
- Single hole structure is dislocating.

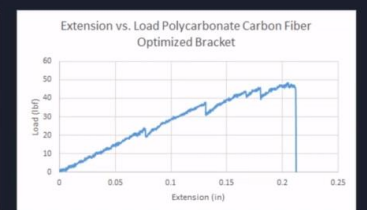
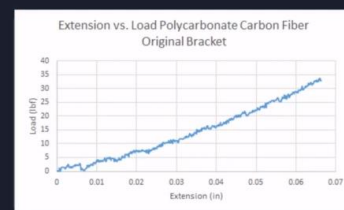


## Optimized Stress Plot

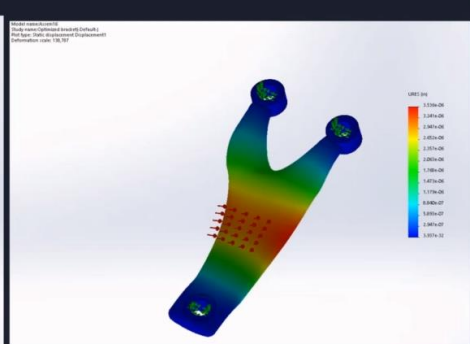
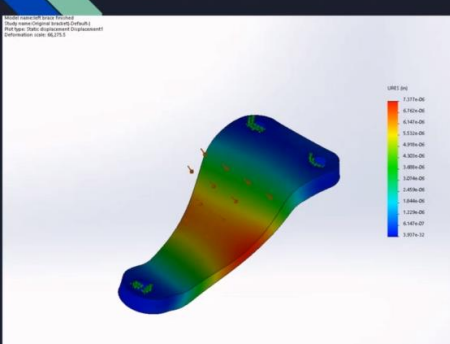


Graphic: Solidworks Simulation

## Test Results



## Displacement plots



Graphics: SolidWorks Simulation

## Conclusion

- Overall the design of the topologized part proved to be as strong or stronger than the original part
- We can see that the 30% removal of material from the part not only saved material but also didn't affect the structural integrity of the mounting bracket